CLAIMS

1. An electromagnetic driving device comprising;

a movable core,

a stator having a housing portion for housing said movable core in such a manner as to move in a reciprocating fashion therein and an attracting portion between which and said movable core a magnetic force is generated for attracting said movable core to one of reciprocating movement directions and cooperating with said movable core to form a magnetic circuit,

a coil for generating a magnetic force which attracts said movable core to said attracting portion side when energized, and

a non-magnetic layer formed on at least one of sides where said housing portion and said movable core are situated, respectively, to diametrically face each other,

and wherein R defined as $(d_1/d_0)\times 100$ is set so as to satisfy $20\% \leqq R \leqq 60\%$, when a magnetic gap which is formed in a radial direction between the housing portion and the movable core and excludes the non-magnetic layers is defined as d0 and air gap which is formed in a radial direction between the housing portion and the movable core and includes the non-magnetic layers when the movable core does not deviate from, but remains coaxial with, the housing portion defined as $d_1$,

and wherein any of said attracting portion, said housing portion and said plunger portion becomes saturated magnetically when the value of electric current that is supplied to said coil increases to reach a predetermined value which falls between 40% or larger and 60% or smaller of a maximum value of electric current that is supplied to said coil.

2. An electromagnetic driving device as set forth in Claim 1, wherein a non-magnetic layer is formed on at least one of sides where said housing portion and said

movable core are situated, respectively, to diametrically face each other, and wherein the total thickness of said non-magnetic layer so formed falls between 40μm or larger and 80μm or smaller.

3. An electromagnetic driving device as set forth in Claim 1 or 2, wherein the hardness of at least one of sliding surfaces of said housing portion and said movable core is made equal to or larger than HV200, and wherein a difference in hardness between said sliding surfaces is equal to or smaller than HV300.

4. An electromagnetic driving device comprising;

a movable core,

a stator having a housing portion for housing said movable core in such a manner as to move in a reciprocating fashion therein and an attracting portion between which and said movable core a magnetic force is generated for attracting said movable core to one of reciprocating movement directions and co-operating with said movable core to form a magnetic circuit, and

a coil for generating a magnetic force which attracts said movable core to said attracting portion side when energized, wherein

a non-magnetic layer is formed on at least one of sides where said housing portion and said movable core are situated, respectively, to diametrically face each other, and wherein the total thickness of said non-magnetic layer so formed falls between 40μm or larger and 80μm or smaller.

5. An electromagnetic driving device as set forth in Claim 4, wherein the hardness of at least one of the sliding surfaces of said housing portion and said movable core is made equal to or larger than HV200, and wherein a difference in hardness between said sliding surfaces is equal to or smaller than HV300.

6. An electromagnetic driving device comprising;

a movable core,

a stator having a housing portion for housing said movable core in such a manner as to move in a reciprocating fashion therein and an attracting portion between which and said movable core a magnetic force is generated for attracting said movable core to one of reciprocating movement directions and co-operating with said movable core to form a magnetic circuit, and

a coil for generating a magnetic force which attracts said movable core to said attracting portion side when energized, wherein

the hardness of at least one of sliding surfaces of said housing portion and said movable core is made equal to or larger than HV200, and wherein a difference in hardness between said sliding surfaces is equal to or smaller than HV300.

7. A flow rate controlling apparatus comprising;

a housing having a plurality of fluid paths which penetrate through a cylindrical circumferential wall,

an electromagnetic driving device as set forth in any of Claims 1 to 6,

a movable member adapted to reciprocate together with said movable core to thereby control the flow rate of fluid flowing through said fluid paths, and

biasing means for biasing said movable member in a direction opposite to a direction in which said movable core is attracted by said attracting portion.